

Career Guidance, Exploration, and Preparation

Instructional
Frameworks for
Advertising Design

**Instructional Frameworks for
Advertising Design
Developed by the
University of Arkansas at Little Rock**

**State of Arkansas
Department of Workforce Education**

NOTICE TO THE READER

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Preface

The Career Guidance, Exploration, and Preparation program continues to prepare students for employment and continuing education. To accomplish this preparation, teachers and employers have collaborated to modify individual programs to ensure that instruction is current and comprehensive. This document reflects essential competencies for program completers as well as all aspects of the Advertising Design Industry as required by the Carl D. Perkins Act. The Curriculum Content Frameworks for all Career Guidance, Exploration, and Preparation programs can be accessed through the Department of Workforce Education Web site.

Foreword

The curriculum content framework Advertising Design supports the courses that prepare students for the following career roles, which in turn correspond to the CIP (Classification of Instructional Programs) codes listed below. The courses may be sequenced with a variety of career and technical courses to form a specialization to prepare students for careers and support additional education and training in the advertising industry.

- Career Family:
- Career Area: 09.09 -- Communication, Journalism, and Related Programs
50.04
- Career Role CIP Code: 50.0402 Graphic Design, Commercial Art, and Illustration
09.0903 -- Advertising
- O-NET: 11-2011, 27-1011, 27-1024, 27-3031

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Table of Contents

Introduction	7
Master Duty/Task List for Advertising Design I & II.....	8
Duty/Task Definitions for Advertising Design I & II	
Practicing Lab Safety.....	14
Examining Advertising Design.....	15
Demonstrating Fundamental Skills and Techniques.....	16
Exploring Elements and Principles of Design.....	17
Applying Illustration Theory.....	18
Working with Typography.....	19
Designing an Advertisement.....	21
Printing an Advertisement.....	22
Applying Design Skills.....	24
Practicing Photography.....	26
Applying Computer Skills.....	27
Developing a Portfolio.....	28
Exploring a Career in Advertising Design.....	29
SkillsUSA/HOSA Task Definitions.....	31
Related Arkansas Standards of Learning	
Introduction.....	36
Reading and Writing.....	40
Mathematics.....	49
Science.....	59
SkillsUSA Advertising Design.....	75
All Aspects of Industry.....	79

Introduction

About the Program

Advertising Design I & II prepares students for careers in the advertising industry. The course sequence focuses on duties and tasks performed by professionals in the advertising industry.

About the Document

- Section 1 contains a master duty/task list for the Advertising Design program.
- Section 2 contains an analysis of each task, consisting of the task, task definition, and process/skill questions to evaluate acceptable performance. All tasks have been designated essential. Essential tasks are those that must be achieved by every student pursuing the completion of the Advertising Design program.
- Section 3 lists the Arkansas Standards of Learning for language arts, mathematics, and science that are reinforced by instruction in the Advertising Design program. Academic skills in these areas are necessary for the mastery of a number of tasks performed by electronic technicians on the job.

Course Descriptions

Advertising Design focuses on the competencies needed for the planning and implementation of a successful advertising program. Students are exposed to basic design skills, digital photography and enhancement, media, methods of research, budgets and evaluation that are used to sell a product, service, or business. Hands-on experience is given in copywriting, layout, typography, and production in various media. Desktop publishing, photo enhancement, and Web page design computer applications are introduced.

Master Duty/Tasks Listing Advertising Design I & II

State experts in the occupational field of advertising design have validated the duties and tasks in this section. Each is analyzed by identifying the following:

- a *duty/task statement*, which describes what the student is to do

DUTY A: Practicing Lab Safety
Task:
A001: React to fire hazards and/or emergencies
A002: Handle chemicals carefully
A003: Handle cutting tools carefully
A004: Wear personal safety apparel
DUTY B: Examining Advertising Design
Task:
B001: Describe the advertising design industry
B002: Identify occupations in the advertising design industry
B003: Examine historical developments in advertising design
B004: Assess characteristics of professionalism
DUTY C: Demonstrating Fundamental Skills and Techniques
Task:
C001: Use measuring devices
C002: Use and maintain instruments and equipment

C003: Practice mechanical drawing skills
C004: Adhere and bond various media
C005: Prepare paperwork and files
C006: Purchase equipment and supplies
DUTY D:
Exploring Elements and Principles of Design
Task:
D001: Identify elements of design and their application
D002: Identify principles of design and their application
D003: Explore color theory
D004: Explore design aesthetics
DUTY E:
Applying Illustration Theory
Task:
E001: Understand the human form and its application to illustration
E002: Complete life drawings
E003: Complete perspective drawings
E004: Complete product illustration
E005: Execute rendering techniques
E006: Use various media for rendering illustrations

DUTY F:
Working with Typography
Task:
F001: Apply hand lettering for roughs/comps
F002: Apply finished hand-lettering techniques
F003: Select appropriate type style
F004: Measure with pica scale
F005: Specify type
F006: Set type Proof copy using proofreader's marks
F007: Proof copy using proofreader's marks
DUTY G:
Designing an Advertisement
Task:
G001: Gather information pertinent to the design objective
G002: Draw in size ratio using the proportional scale
G003: Use thumbnail sketches
G004: Draw a rough
G005: Prepare a comprehensive
G006: Produce a mockup/dummy
DUTY H:
Printing an Advertisement
Task:
H001: Calculate percentage of enlargement or reduction with proportional scale

H002: Prepare photos for reproduction
H003: Explore mechanical paste-up theory
H004: Prepare instructional overlay sheet for printing
H005: Select paper stock and ink for reproduction
H006: Differentiate between printing processes
H007: Produce a color-separated page
H008: Demonstrate skills for communicating with print shops
DUTY I:
Applying Design Skills
Task:
I001: Design an image for screen print
I002: Design a point-of-purchase display
I003: Draw and render a technical illustration
I004: Produce a package design
I005: Prepare a storyboard
I006: Produce a visual display
I007: Prepare a corporate identity package
I008: Design posters

I009: Design billboard/outdoor displays
I010: Apply interactive design strategies
I011: Apply industrial design principles
DUTY J: Practicing Photography
Task:
J001: Identify the characteristics of various types of cameras and the images they produce (emphasis on digital)
DUTY K: Applying Computer Skills
Task:
K001: Demonstrate basic computer skills
K002: Use page layout software
K003: Apply photo-manipulation skills
K004: Create Web design graphics
K005: Prepare electronic files and images
K006: Create a multimedia presentation
K007: Create computer-based animation
DUTY L: Developing a Portfolio
Task:
L001: Assemble and maintain a portfolio

L002: Prepare a resume
L003: Prepare a cover letter
L004: Prepare a self-promotion piece
DUTY M:
Exploring a Career in Advertising Design
Task:
M001: Explore career opportunities
M002: Identify sources of employment
M003: Analyze potential barriers to employment
M004: Analyze opportunities for personal and career growth
M005: Assess the impact of technology in the workplace
M006: Examine considerations of starting a freelance business

Task Definitions

State experts in the occupational field of advertising design have validated tasks in this section.

Each task is analyzed by identifying the following:

- a *task definition* (criteria for acceptable performance), which explains what the student has to do to perform the task at the expected level of mastery
- *process/skill questions*, which assess student knowledge and performance

Tasks are arranged by instructional duty area only. The placement of tasks into specific courses and the sequencing of tasks for instruction are local decisions based on student needs, employer demand, and school schedules.

DUTY A: Practicing Lab Safety
Task:
A001: React to fire hazards and/or emergencies <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Follow standard workplace fire safety and/or other emergency procedures as directed by employer or instructor Process/Skill Questions
A002: Handle chemicals carefully <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Adhere to all standard practices established by industry and OSHA for safe handling of chemicals related to advertising design <ul style="list-style-type: none"> - Spray adhesive - Spray mount - Spray booth Process/Skill Questions
A003: Handle cutting tools carefully <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Follow all standard practices established by industry for the safe handling of cutting tools used in advertising design <ul style="list-style-type: none"> - X-ACTO knives - Paper cutters Process/Skill Questions

A004: Wear personal safety apparel

Definition: Process should include the following:

- Follow all standard practices established by industry and OSHA for the proper use of personal safety apparel

Process/Skill Questions

**DUTY B:
Examining Advertising Design****Task:****B001: Describe the advertising design industry**

Definition: Process should include the following:

- List the primary vehicles used by the advertising industry:
 - Print
 - TV and radio broadcasting
 - Electronic
- Review the primary activities of advertising design:
 - Photo art direction
 - Broadcast production
 - Copyrighting
 - Creating letterhead
 - Branding products or services
 - Designing logos

Process/Skill Questions

B002: Identify occupations in the advertising design industry

Definition: Process should include the following:

- List jobs commonly found within the advertising design industry:
 - Art director
 - Copywriter
 - Producer
 - Graphic designer
 - Production artist
 - Account executive
 - Public relations

Process/Skill Questions

B003: Examine historical developments in advertising design

Definition: Process should include the following:

- Discuss the impact historical events and figures have had on advertising design:
 - VW campaign during the 1960s
 - Eras of advertising
 - Historical trends
 - Glaser
 - Ogleby

Process/Skill Questions

B004: Assess characteristics of professionalism

Definition: Process should include the following:

- Maintain highest level of personal ethics and conduct
- Maintain personal appearance appropriate to the situation
- Maintain needs of the client as foremost
- Give and receive constructive criticism
- Ensure creative originality
- Discuss brainstorming techniques both as a group and individually
- Ensure copyright laws and usage issues are considered and followed as they apply to stock and commissioned photography

Process/Skill Questions

**DUTY C:
Demonstrating Fundamental Skills and Techniques****Task:****C001: Use measuring devices**

Definition: Process should include the following:

- Perform various measurements with devices common to advertising design
 - Common ruler
 - Pica ruler
 - Proportion wheel
 - Stop watch

Process/Skill Questions

C002: Use and maintain instruments and equipment

Definition: Process should include the following:

- Demonstrate proper use and care of all associated instruments and equipment commonly associated with advertising design and creation

Process/Skill Questions

C003: Practice mechanical drawing skills

Definition: Process should include the following:

- Demonstrate basic drawing skills:
 - Pen and ink
 - Lettering
 - Perspective
 - Line drawing

Process/Skill Questions

C004: Adhere and bond various media

Definition: Process should include the following:

- Discuss methods of adhesion and bonding media
- Use spray mounting
- Use a spray booth
- Prepare a presentation

Process/Skill Questions

C005: Prepare paperwork and files

Definition: Process should include the following:

- Discuss methods of organizing paperwork and files
- Create and organize computer files
- Develop files for art direction
- Archive files
- Retrieve archived files

Process/Skill Questions

C006: Purchase equipment and supplies

Definition: Process should include the following:

- Discuss types of equipment and supplies
- Review common purchasing methods
- Describe methods of managing supply and equipment inventories

Process/Skill Questions

**DUTY D:
Exploring Elements and Principles of Design****Task:****D001: Identify elements of design and their application**

Definition: Process should include the following:

- List the elements of design, including shapes, body copy, and photo logos

Process/Skill Questions

D002: Identify principles of design and their application

Definition: Process should include the following:

- List the principles of design, including symmetry, asymmetrical design, and balance
- List the applications of design principles

Process/Skill Questions

D003: Explore color theory

Definition: Process should include the following:

- Discuss color theory:
 - Complementary colors
 - Psychology/Rhetoric of color(s)
 - Composition of color
 - Separation of color

Process/Skill Questions

D004: Explore design aesthetics

Definition: Process should include the following:

- Discuss design aesthetics:
 - Style -- what it is and its trends
 - Typeface and style and their application

Process/Skill Questions

DUTY E: Applying Illustration Theory

Task:

E001: Understand the human form and its application to illustration

Definition: Process should include the following:

- Review the human skeletal and muscular form and its proportion

Process/Skill Questions

E002: Complete life drawings

Definition: Process should include the following:

- Sketch a figure study with attention to the form as a whole
- Sketch a figure study with attention to the detail of the form

- Sketch a figure study with attention to gestures and motion

Process/Skill Questions

E003: Complete perspective drawings

Definition: Process should include the following:

- Explain perspective
- Complete drawings from different perspectives

Process/Skill Questions:

E004: Complete product illustration

Definition: Process should include the following:

- Explain style in product illustration
- Explain style in spot illustration

Process/Skill Questions

E005: Execute rendering techniques

Definition: Process should include the following:

- Draw a thumbnail sketch
- Draw a comprehensive sketch
- Use marking techniques
- Use various media

Process/Skill Questions

E006: Use various media for rendering illustrations

Definition: Process should include the following:

- Review the various media available for rendering:
 - Markers
 - Watercolors
 - Acrylics
 - Pen and ink
 - Oil paint
 - Computer graphics
 - Illustrator
 - Photoshop
- Render an illustration using a variety of media

Process/Skill Questions

DUTY F: Working with Typography

Task:

F001: Discuss hand lettering for roughs/comps

Definition: Process should include the following:

- Review the types of lettering used with roughs/comps
- Explain how to accurately recreate/render typeface

Process/Skill Questions

F002: Apply finished hand-lettering techniques

Definition: Process should include the following:

- Review the process for application of finished hand lettering

Process/Skill Questions

F003: Select appropriate type style

Definition: Process should include the following:

- Identify type, classifications, and usage:
 - Serif
 - Sans serif
 - Bold
- Apply appropriate style to medium, situation, and/or client
- List standard fonts

Process/Skill Questions

F004: Measure with pica scale

Definition: Process should include the following:

- Demonstrate familiarity with a pica scale

Process/Skill Questions

F005: Specify type

Definition: Process should include the following:

- Review the process of type selection, including size, style, weight, leading, kerning, and tracking

Process/Skill Questions

F006: Set type

Definition: Process should include the following:

- Discuss application of style, size, leading, and proofing

Process/Skill Questions

F007: Proof copy using proofreader's marks

Definition: Process should include the following:

- Review proofreading marks
- Apply standard proofreader's marks in copy proofing

Process/Skill Questions

**DUTY G:
Designing an Advertisement****Task:****G001: Gather information pertinent to the design objective**

Definition: Process should include the following:

- List the pertinent elements of design objectives:
 - Target audience
 - Demographics
 - Psychographics
 - Objective
 - Results
 - Unique benefits of product
 - Measurable outcome/success

Process/Skill Questions

G002: Draw in size ratio using the proportional scale

Definition: Process should include the following:

- Explain the theory of size ratio

Process/Skill Questions

G003: Use thumbnail sketches

Definition: Process should include the following:

- Discuss the importance of the thumbnail sketch in the design process

Process/Skill Questions

G004: Draw a rough

Definition: Process should include the following:

- Adapt a thumbnail into a rough (a refined thumbnail)

Process/Skill Questions

G005: Prepare a comprehensive

Definition: Process should include the following:

- Transform a rough into a comprehensive using available technology
- Understand the purpose and use of a comprehensive

Process/Skill Questions

G006: Produce a mockup/dummy

Definition: Process should include the following:

- Discuss the elements of mockup/dummy creation:
 - Trimming
 - Cutting
 - Printing
 - Presentation
- Understand facets of presentation
- Understand physical aspects of the final piece (i.e., printing style and binding)

Process/Skill Questions

DUTY H: Printing an Advertisement

Task:

H001: Calculate percentage of enlargement or reduction with proportional scale

Definition: Process should include the following:

- Explain the process of calculating percentage of enlargement or reduction using a proportional scale

Process/Skill Questions

H002: Prepare photos for reproduction

Definition: Process should include the following:

- Determine application
- Determine size
- Perform color correction
- Retouch photo
- Convert files as needed

Process/Skill Questions

H003: Explore mechanical paste-up theory

Definition: Process should include the following:

- Understand document preparation for printing:
 - Measure size of elements
 - Determine alignment
 - Confirm type alignment

<ul style="list-style-type: none"> - Assess completeness
Process/Skill Questions
<p>H004: Prepare instructional overlay sheet for printing</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Show color breakdown • Determine miscellaneous instructions to printer
Process/Skill Questions
<p>H005: Select paper stock and ink for reproduction</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Determine usage: <ul style="list-style-type: none"> - Color, cost, coated, or uncoated • Determine weight: <ul style="list-style-type: none"> - Texture - Type print used • Determine ink <ul style="list-style-type: none"> - Spot color (PMS) - Process color (CMYK) - Type ink
Process/Skill Questions
<p>H006: Differentiate between printing processes</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Discuss Web-produced printing: <ul style="list-style-type: none"> - High volume • Discuss digital printing: <ul style="list-style-type: none"> - Sheet-feed • Discuss silk screen: <ul style="list-style-type: none"> - Signs, banners , billboards, T-shirts
Process/Skill Questions
<p>H007: Produce a color-separated page</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Apply color theory
Process/Skill Questions

H008: Demonstrate skills for communicating with print shops.

Definition: Process should include the following:

- Review essential elements communicated to print shops
 - Type printing
 - Quantity
 - Type delivery
 - Paper
 - Ink
 - Cutting
 - Folding
 - Stapling
 - Binding

Process/Skill Questions

**DUTY I:
Applying Design Skills****Task:****I001: Design an image for screen print**

Definition: Process should include the following:

- Apply the principles of design
- Understand limitations

Process/Skill Questions

I002: Design a point-of-purchase display

Definition: Process should include the following:

- Apply the principles of design
- Discuss the impact of display placement
- Describe how the display will be presented
- Review how the display will be shipped

Process/Skill Questions

I003: Draw and render a technical illustration

Definition: Process should include the following:

- Apply the principles of design
- Explain technique selection
- Explain medium selection
- Ensure the technical accuracy of the illustration

Process/Skill Questions

I004: Produce a package design

Definition: Process should include the following:

- Apply the principles of design
- Describe the packaging function
- Ensure packaging design protects the product
- Understand the impact of competitive designs
- Explain the impact of environment on packaging placement
- Determine the impact of industry norms on package design

Process/Skill Questions

I005: Prepare a storyboard

Definition: Process should include the following:

- Ensure the concept is communicated to the client
- Select location and style
- Select style of type
- Determine placement of logo
- Describe the use of camera angles when appropriate
- Verify the accurate representation of the script
- Establish good communication with the production company

Process/Skill Questions

I006: Produce a visual display

Definition: Process should include the following:

- Apply the principles of design
- Explain the impact of placement on the display design
- Discuss the impact of shipping on the display design

Process/Skill Questions

I007: Prepare a corporate identity package

Definition: Process should include the following:

- Apply the principles of design
- Design a logo
- Design brochures, stationery, and business cards
- Develop a corporate identity manual, as required
- Discuss how to communicate the client's corporate identity
- Describe the impact the client's industry has on the presentation of corporate identity

Process/Skill Questions

<p>I008: Design posters</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Apply the principles of design <p>Process/Skill Questions</p>
<p>I009: Design billboard/outdoor displays</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Apply the principles of design • Discuss special effects used with billboards/outdoor displays • Explain the method for determining placement of billboard/outdoor displays <p>Process/Skill Questions</p>
<p>I010: Apply interactive design strategies</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Discuss interactive design strategies and their application to advertising design <p>Process/Skill Questions</p>
<p>I011: Apply industrial design principles</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Discuss principles of industrial design and their application <p>Process/Skill Questions</p>
<p>DUTY J: Practicing Photography</p>
<p>Task:</p>
<p>J001: Identify the characteristics of various types of cameras and the images they produce (emphasis on digital)</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of visual language (elements and principles of design and composition as they relate to photography) • Critique photographic work in terms of technique and content • Describe lighting as it relates to photography • Discuss the concept of exposure • Discuss setting/background, composition, camera angle, and camera distance <p>Process/Skill Questions</p>

DUTY K: Applying Computer Skills
Task:
K001: Demonstrate basic computer skills <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Demonstrate basic skills within a MS Windows environment, using commonly accepted applications • Demonstrate basic skills within an Apple desktop environment, using commonly accepted applications Process/Skill Questions
K002: Use page layout software <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Demonstrate basic skills with various page layout software programs <ul style="list-style-type: none"> - Quark Express (Mac) - Illustrator (Mac) - In Design (PC) - PageMaker (PC) Process/Skill Questions
K003: Apply photo-manipulation skills <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Demonstrate basic skills with Photoshop <ul style="list-style-type: none"> - Retouch - Color correction - Crop - Adjust density, contrast, hue, and sharpness - Apply artistic manipulation Process/Skill Questions
K004: Create Web design graphics <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Demonstrate basic understanding of Web design applications (Dreamweaver, Front Page) • Create a basic Web page with links Process/Skill Questions

K005: Prepare electronic files and images

Definition: Process should include the following:

- Collect for output (logos, photos, and assorted elements)
- Review elements to ensure consistency with type printing
- Discuss how outputs will be transmitted (electronically, portable storage)
- Convert files to PDF

Process/Skill Questions

K006: Create a multimedia presentation

Definition: Process should include the following:

- Demonstrate basic skills with multimedia applications
 - MS Power Point
 - KeyNote (Apple)
 - Macromedia applications (Dreamweaver, Flash, Fireworks)

Process/Skill Questions

K007: Create computer-based animation

Definition: Process should include the following:

- Demonstrate a basic familiarity with commonly accepted animation applications

Process/Skill Questions

**DUTY L:
Developing a Portfolio****Task:****L001: Assemble and maintain a portfolio**

Definition: Process should include the following:

- Select products that represent your skills
- Develop a presentation format for the portfolio
- Discuss the importance of updating a portfolio
- Create a portfolio

Process/Skill Questions

L002: Prepare a resume

Definition: Process should include the following:

- Assemble the required information for a resume
- Describe organizational styles for resumes

- Prepare a resume

Process/Skill Questions

L003: Prepare a cover letter

Definition: Process should include the following:

- Discuss the function of a cover letter
- Describe cover letter formats
- Prepare a cover letter

Process/Skill Questions

L004: Prepare a self-promotion piece

Definition: Process should include the following:

- Discuss the objective of the piece
- Develop a concept for the piece
- Select media
- Prepare a self-promotion piece

Process/Skill Questions

DUTY M: Exploring a Career in Advertising Design

Task:

M001: Explore career opportunities

Definition: Process should include the following:

- Describe the multiple aspects of the advertising industry

Process/Skill Questions

M002: Identify sources of employment

Definition: Process should include the following:

- Identify the advertising industry in your community
- Discuss a variety of markets represented in the local advertising industry
- Select three agencies to investigate

Process/Skill Questions

M003: Analyze potential barriers to employment

Definition: Process should include the following:

- Determine the skills required for entry-level jobs

- Determine the educational requirements for entry-level jobs

Process/Skill Questions

M004: Analyze opportunities for personal and career growth

Definition: Process should include the following:

- Identify personal skill gaps as they relate to the advertising industry
- Develop an action plan to narrow those skill gaps

Process/Skill Questions

M005: Assess the impact of technology in the workplace

Definition: Process should include the following:

- Identify specific technologies found in the advertising industry
- Investigate emerging technologies of the future

Process/Skill Questions

M006: Examine considerations of starting a freelance business

Definition: Process should include the following:

- Describe the elements of a business plan
- Develop a business plan for a simulated freelance business

Process/Skill Questions:

SkillsUSA

Task Definitions

DUTY A: Self-improvement
Task:
A001: Complete a self-assessment and identify individual learning styles <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Identify and list individual strengths • Identify and list areas in need of improvement Process/Skill Questions
A002: Discover self-motivation techniques and establish short-term goals <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Develop a list of short-term goals • Discuss ways to change or improve lifestyle appearance and behavior Process/Skill Questions
A003: Determine individual time-management skills <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Prepare and keep a time journal • Discuss ways to improve time-management skills Process/Skill Questions
A004: Define future occupations <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Search the Internet for career opportunities within specified fields of study • Prepare a presentation on a specified career area Process/Skill Questions
A005: Develop an awareness of cultural diversity and equity issues <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Research a tradition modeled by the individual's family • Develop personal philosophy statements regarding gender equity Process/Skill Questions

A006: Define the customer

Definition: Process should include the following:

- Differentiate between external and internal customers
- Discuss factors that contribute to poor customer relationships

Process/Skill Questions

A007: Recognize the benefits of doing a community service project

Definition: Process should include the following:

- Discuss and list ways to become involved in the community
- Develop a community service project

Process/Skill Questions

A008: Demonstrate effective communication with others

Definition: Process should include the following:

- Identify and list personal barriers to listening
- Develop a personal plan to overcome barriers to listening

Process/Skill Questions

A009: Participate in a shadowing activity

Definition: Process should include the following:

- Summarize the experience of the job shadowing activity

Process/Skill Questions

A010: Identify the components of an employment portfolio

Definition: Process should include the following:

- Identify the parts of a portfolio
- Design a personal employment portfolio

Process/Skill Questions

A011: List proficiency in program competencies

Definition: Process should include the following:

- Complete an interpersonal competency assessment

Process/Skill Questions

DUTY B: Civic, Social, and Business Awareness
Task:
B001: Measure/modify short-term goals <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Discuss steps to pursue short-term goal(s) Process/Skill Questions
B002: Identify stress sources <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • List personal sources of stress • Discuss techniques to cope with individual sources of stress Process/Skill Questions
B003: Select characteristics of a positive image <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Discuss actions and traits that lead to a positive image • Discuss actions and traits that lead to a negative image Process/Skill Questions
B004: Demonstrate awareness of government, professional organizations, and trade unions <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Identify the state governor, legislators, and senators • Identify professional organizations pertaining to specific career areas Process/Skill Questions
B005: Apply team skills to a group project <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Form a team to develop a class project Process/Skill Questions
B006: Observe and critique a meeting <i>Definition:</i> Process should include the following: <ul style="list-style-type: none"> • Attend a formal meeting held within the community

<ul style="list-style-type: none"> • Critique the attended meeting <p>Process/Skill Questions</p>
<p>B007: Demonstrate business meeting skills</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and discuss the basic rules to ensure an orderly and business-like meeting • Role-play appropriate meeting skills <p>Process/Skill Questions</p>
<p>B008: Demonstrate social etiquette</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Role-play appropriate social behavior • Differentiate between good and bad manners <p>Process/Skill Questions</p>
<p>B009: Complete survey for employment opportunities</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Gather information on a particular employment opportunity of interest • Conduct an Internet search of a specific career area <p>Process/Skill Questions</p>
<p>B010: Review a professional journal and develop a 3- to 5-minute presentation</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Develop a presentation on the content, purpose, and distribution of a particular professional journal <p>Process/Skill Questions</p>
<p>B011: Identify customer expectations</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • List and discuss customer expectations • Discuss the consequences of unmet customer expectations <p>Process/Skill Questions</p>
<p>B012: Complete a job application</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Obtain a job application from various businesses in the community

<ul style="list-style-type: none"> • Conduct a mock job interview <p>Process/Skill Questions</p>
<p>B013: Identify a mentor</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Define mentor • Discuss ways in which a mentor can help an individual meet career goals <p>Process/Skill Questions</p>
<p>B014: Assemble your employment portfolio</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Develop an employment portfolio <p>Process/Skill Questions</p>
<p>B015: Explore supervisory and management roles in an organization</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Examine an organizational chart • Discuss the responsibilities of managers and supervisors <p>Process/Skill Questions</p>
<p>B016: Recognize safety issues</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Discuss the safety issues within a given career area <p>Process/Skill Questions</p>
<p>B017: Evaluate your proficiency in program competencies</p> <p><i>Definition:</i> Process should include the following:</p> <ul style="list-style-type: none"> • Define task and competency • List competencies associated with a specified career area <p>Process/Skill Questions</p>

Curriculum Frameworks

Purpose

This section of the framework contains material to help instructors in technical and professional programs reinforce basic skills in the areas of reading and writing, mathematics, and science. The technical portion of this guide takes a more direct approach by using specific duty and task listings, but changes in the academic section lead in a more general direction. The reason for this is simple: All good instructors do not teach in the same way. However, all good instructors share the trait of being able to connect their material to everyday life. For example, understanding concepts related to heat are important for cosmetology students as well as lathe operators in manufacturing plants. However, each program will probably take a different approach in the amount of detail and examples relating to heat concepts. Both groups require basic science knowledge of principles relating to heat, but the application of the principles will be different.

Basic Skills: The Content Areas

Included in this guide are materials to support basic skills in reading and writing, mathematics, and science. The overall approach taken here is a move toward problem-solving skills. By problem solving, we mean the ability to take information and use it for a purpose: to take action, make decisions, predict outcomes, suggest improvements. Another term for these thinking skills is a general “literacy.”

Literacy skills always have been in demand in the workplace. A quick review of workplace training programs and other literature regarding adult education demonstrates that the need for a literate workforce is still one of the most pressing problems employers face today. Indeed, many employers (from small- and medium-sized businesses to Fortune 500 companies) have spent hundreds of millions of dollars on in-house basic skills training programs.

What constitutes a literate workforce? There are many definitions for literacy and hundreds of tests that measure it, but when employers are asked what they’re looking for in potential new hires, the answers are general: They want individuals who can read and write; show up on time;

think and solve problems; and keep their personal lives in order (that is, don't bring a drinking problem into the workplace).

Viewed in this way, the words “literacy” and “literate” are good terms for what educators are trying to instill in their students, the future workforce. The more common definition (being able to read and write) is certainly appropriate, but the additional definitions (knowledgeable, educated, and well-informed) are also apt. It is this broad term, “literate,” that we use to guide instructors on what to cover in the classroom. No matter which Career and Technical Education area is being focused on, no matter how technical the terminology is, instructors are given the task of helping students take information, break it down into necessary parts, process details, and be able to come away with an understanding of some sort. This is “literacy,” and the process is the same for every subject area--teaching students how to think and solve problems.

Format

Each section includes a two-column table. Skills are listed on the left side; suggestions for implementing these skills into the curriculum are listed on the right side. Each suggestion is written in such a way that it can be tailored to most Career and Technical Education programs.

Using the Guide

This guide was prepared with four concepts in mind:

- The instructor is *aware of the need* for students to improve their basic skills.
- The instructor is the *best-qualified person* to decide how to include this material in the classroom or lab. The students' abilities and needs should drive the instructor in deciding how to use, expand, or modify these topics.
- The instructor *already has curriculum that works* for his or her students. Therefore, the suggestions for reinforcing basic skills
 - must be easy to implement.
 - must stand alone.
 - do not need to be taught in a particular order.
 - must be open-ended enough to be useful for any career and technical program.

- ***Time is limited.*** Unless there are quick ways to reinforce basic skills, changes to the curriculum will not be made. Teaching basic skills in the context of technical material will help students make connections that are more memorable and will require no additional lesson planning. Just as instructors incorporate updates in technical knowledge, they can add basic skills concepts as well. Adding a few concepts at a time will help students perform better in the lab as well as on tests and evaluations.

Methods

The following methods may help instructors decide how to increase basic skill knowledge:

- *Collaborative projects* -- how could a joint project between regular education teachers and vocational instructors reinforce concepts for both programs?
- *Outside assignments* -- would students benefit from an outside assignment explaining how a basic math (science, reading) concept ties to a process in the lab?
- *Extra credit* -- students needing extra credit can research outside topics and turn in a short summary of material.
- *“Need-to-know” assignments* -- students prepare a bulleted list of the basic concepts in science they need to know to correctly perform ____ operation in the lab.
- *Question of the day* -- a few daily math problems for students to answer at the beginning of class allow the instructor to set the tone for the material. This method also gives students an immediate goal when they enter the classroom and teaches them to stay on task. Bonus points may be awarded at the end of the week, quarter, semester, etc.
- *Two-minute oral presentations* -- students who need to practice speaking skills can be asked to give a two-minute oral presentation at the end of class summarizing the main points for the day. Or, a two-minute presentation at the beginning of class can recap the material from a previous class.
- *Connecting with workers* -- students can poll parents, friends, area employers, or other people to find out the top five basic science skills needed on the job.
- *Direct questioning* -- include a few basic knowledge questions in a presentation. Award points to groups based on correct answers.

Resources

In creating the Academic Reinforcement material for the technical and professional frameworks, we used a number of source documents and resources.

- The English Language Arts, Science, and Mathematics components of the *Curriculum Improvement Project* by Dr. Willard Daggett were consulted to ensure that the top-ranked skills in those areas would be reflected in the academic support material. The English Language Arts and Science components have many linkages to the material included here. (The higher-level math skills such as trigonometry were not included in this document.)
- The Workplace Skills Enhancement Program (WSEP) at the University of Arkansas at Little Rock (UALR) has completed many training projects and job profiles for employers in Arkansas and has collected data from this work with Arkansas employers. Our constant contact with workers and employers provides a tremendous amount of data that we use in designing customized training programs and in working on projects such as curriculum frameworks. Also, the staff of WSEP has experience teaching in Arkansas public schools, the U.S. military, and Job Corps.
- Additionally, other groups within UALR (the Labor Education Program, the Institute for Economic Advancement, and the College of Business) provide resources regarding health and safety information, labor unions and their role in the workplace, computer and information technology, and other training and outreach program data.
- The U.S. Department of Labor (DOL) has many online documents and publications that support workers and issues regarding the workplace. (Work by Philippi and Greenan, 1988, on workplace skills was especially helpful.) Visit the Web site at www.dol.gov.
- The Occupational Safety and Health Administration (OSHA) provides online and other resources for instructors and professionals. For topics relating to safety and health, visit www.osha.gov.
- The Multistate Academic and Vocational Curriculum Consortium (MAVCC) is an organization that develops competency-based curriculum. For more on MAVCC, see www.mavcc.org.

ACADEMIC STANDARDS FOR READING AND WRITING

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Objective	Classroom Applications to Industry
<p><i>Present</i> <i>Review, and discuss</i> Master the list of skills employers want for the workplace regarding reading and writing</p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • Discussion • Interviewing parents or other adults in the workplace about the skills required • Interviewing employers about the skills in terms of importance • Identifying workplace situations in which certain skills become more important than others • Researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs • Researching the topic of adult literacy
<p><i>Answer</i> simple comprehension or recall questions from a lecture or from written material</p>	<p>Provide two examples of workplace materials* on students' reading level. With the first, allow students to read information and then answer brief recall questions. With the second example, read aloud the material but do not give a handout. Ask brief recall questions.</p> <p>Compare the differences. How do students retain information better—orally or</p>

	visually? Discuss learning styles and impact on the job.
<i>Follow, give</i> oral instructions	Using instructions for a hands-on task, have students give <u>oral</u> instructions to a partner or group. Rate the effectiveness of the speaker.
<i>Follow, give</i> written instructions	Using a short list of instructions for a hands-on task, have students give <u>written</u> instructions to a partner or group. Rate the effectiveness of the speaker.
<i>Show</i> the difference between relevant and irrelevant details	Using a copy of workplace materials*, students underline relevant or important details in red, irrelevant or less important details in blue.
<i>Sort</i> objects based on x number of criteria	Using workplace materials*, sort a group of objects based on characteristics identified by instructor (e.g., by color, shape, defect, or a combination of these).
<i>Recognize, identify</i> technical vocabulary	Using workplace materials*, highlight technical vocabulary terms. Create a class dictionary of industry-related technical vocabulary. Students may add illustrations or diagrams. Each student receives a copy of the final product. Emphasize skills such as alphabetical order, guidewords, prefixes, suffixes, and pronunciation guides.
<i>Read</i> aloud	Read aloud from workplace materials* in groups or individually.
<i>Identify, explain</i> symbols, abbreviations, and acronyms relevant to subject area	Using workplace materials*, highlight symbols, abbreviations, and acronyms. Create a table with one column for each: symbols, abbreviations, acronyms. Classify each one and write in the meaning.
<i>Understand, use</i> rules of grammar, usage, spelling, punctuation	Identify the missing punctuation marks, misspelled words, and incorrect use of grammar from workplace materials*.

	Correct the mistakes.
<i>Discuss</i> <u>uses and purposes</u> of a variety of workplace communication tools	Find examples of a business letter, memo, report, brochure, proposal, schematic, map, and diagram.
<i>Duplicate</i> process demo by instructor	Using a workplace process, demonstrate steps to complete and have students perform individually or in groups.
<i>Notice, apply</i> word analysis techniques	Using workplace materials*, identify prefixes, suffixes, or roots that indicate meaning (e.g., therma = heat). ¹
<i>Match</i> parts from photographs or diagrams to actual objects	Using workplace materials*, follow a sequence of pictures or diagrams to build, create, or copy an item or process.
<i>Read</i> for main ideas and details	Use a graphic organizer ¹ to show main ideas and supporting details.
<i>Distinguish</i> between fact, opinion, and inference	Collect examples of materials based on fact or opinion/inference. Ask students to underline key terms that indicate the presence of facts or opinions.
<i>Distinguish</i> between rows and columns	Using charts or tables from workplace materials*, discuss the reasons for this format.
<i>Identify</i> a cell as a block where a row and column intersect	Identify the quantity in a particular cell.
<i>Select, use</i> appropriate resources and reference tools	<p>Explain the uses for the following: dictionary, thesaurus, almanac, atlas, card catalog, encyclopedia.</p> <p>List reasons for choosing one reference tool over another.</p> <p>Use reference tools to answer questions related to industry or current events.</p>
<i>Paraphrase</i> written or oral material into summary form	Using workplace materials*, determine the best way to condense or shorten the material so as to give an overview to a layperson.

	Using a set of guidelines appropriate to students' level in length and detail, summarize the information into bullet points.
<i>Interpret, fill out/complete</i> forms and records	<p>Using workplace materials*, answer basic questions (e.g., summarize the list of parts from an inventory).</p> <p>Using blank forms or documents, fill in details. Pay close attention to directions. Students critique work with a partner.</p> <p>Create a form or document to be used in a workplace process.</p>
<i>Use, develop a process for remembering</i> details	Use pneumatic devices to organize and remember details. Pneumatic devices ¹ include Semantic Maps, Thought Webs, and other creative tools to organize thinking.
<i>Proofread, correct</i> mistakes in written drafts	<p>Using a newspaper article, locate and mark mistakes in grammar, punctuation, or usage.</p> <p>Correct mistakes in written drafts.</p>
<i>Examine different types of writing used in the workplace (reports, memos, brochures, logs, blueprints, formulas, etc.)</i>	<p>Gather samples of workplace materials*. Identify each by type.</p> <p>Compare and contrast the difference between:</p> <ul style="list-style-type: none"> • audience (who the document is written for) • length • background information/education needed to understand material • level of detail • organization and layout of the document
<i>Understand</i> the writing process	<p>In order to apply the writing process, create a workplace communication tool to be used for a specific purpose.</p> <p>Prewrite: Brainstorm, gather facts, or do research to</p>

	<p>create a <u>business letter, memo, report, brochure, proposal, schematic, map, or diagram</u>.</p> <p>Identify the audience.</p> <p>Determine the purpose of the document.</p> <p>Write: Create a first draft.</p> <p>Revise and edit: Make changes to ensure accuracy.</p> <p>Look at the writing from a different point of view.</p> <p>Shorten or make more concise where possible.</p> <p>Use white space, bold print, and other formatting details to make the document easy to read.</p> <p>Publish: Decide on the best format for the final copy (size, type of material, layout, graphics, etc.)</p> <p>Publish the final draft.</p>
<i>Identify, create</i> sentences of different types	<p>Using workplace materials*, find sentences of varying types. Examples include simple sentences (subject + predicate) and complex sentences (subject + predicate including clauses).</p> <p>Write sentences, paragraphs, or essays using sentences of different types (e.g., write a two-paragraph summary of today's lesson).</p>
<i>Identify, use</i> contractions correctly	<p>Using workplace materials*, locate contractions (e.g., isn't, I'll).</p> <p>Identify misuses of contractions.</p>

	Write a short list of directions relating to an industry process, and use as many contractions as possible.
<i>Identify, use correctly</i> commonly misspelled words	<p>Using a list of commonly misspelled words¹, locate errors in the media (newspaper articles, Internet sites, magazines).</p> <p>Ask each student to identify his/her problem words from the list.</p> <p>Attempt to incorporate problem words into class activities (e.g., add them to a list of work instructions).</p> <p>Give short weekly quizzes focusing on five words per week. Award bonus points.</p>
<i>Identify, use correctly</i> the English irregular verbs	<p>From a list of irregular verbs, review the uses of each.</p> <p>Ask each student to identify his/her problem irregular verbs from the list.</p> <p>Attempt to incorporate problem verbs into class activities, such as making a collection of mistakes from print sources.</p>
<i>Identify, use</i> signal words and other cues to improve writing	<p>Use a list of signal words¹ and discuss their purpose in writing (signal words are words that raise a flag to a reader to pay attention). Examples --</p> <p>Signal words showing emphasis: Most of all, It should be noted, Of course</p> <p>Signal words showing a conclusion: Lastly, In summary, Finally</p> <p>Identify common signal words in workplace writing, especially in sequenced lists.</p> <p>Write a list of work instructions using signal words.</p>
<i>Identify</i> components of workplace documents such as blueprints,	Label the parts of a workplace document.

schematics, floor plans, and other industry-related documents	
<i>Place steps in proper sequence</i>	Using a list of steps or pictures, cut them apart so students can place them in the proper order.
<i>Analyze cause and effect</i>	Experiment with cause and effect in the classroom (e.g., change the sequence of events in a process).
<i>Determine missing information</i>	<p>Locate the information that is missing from a problem, and explain why the problem cannot be solved without it.</p> <p>To reinforce concepts, use a completed problem and remove the important details. Ask students if they can identify what's missing.</p>
<i>Differentiate between tools used for a job</i>	Given a list of tools and a list of functions, identify the most efficient tool for each task.
<i>Assemble or disassemble objects</i>	<p>From a list of oral or written instructions, assemble an object or complete a process.</p> <p>Have students write the instructions for disassembly.</p>
<i>Cross-reference materials to compare information</i>	Using more than one source document, compare the information given.
<i>Interpret reasoning behind rules or regulations</i>	Using workplace materials*, make a list of possible reasons or justifications for a safety guideline, regulation, etc.
<i>Show contrasts between approaches</i>	<p>Given a workplace scenario, write a brief approach to solving the problem. (Working in groups would be beneficial.)</p> <p>Compare and contrast each approach from the perspective of a worker, manager, supervisor.</p>
<i>Organize data in a new format</i>	Using workplace materials*, organize the information into a new format.

<i>Prove a rule or method's sufficiency</i>	Perform an experiment to determine how much tolerance is acceptable in a case study (e.g., find the range of drops of red dye sufficient to match the standard red color used in latex paint).
<i>Show relationships between two or more systems</i>	Using two or more partners related to industry, show or explain how they are interrelated (e.g., explain the relationship between social workers and hospitals).
Given examples of emergency situations, identify a real-world course of action	Using an emergency situation common to your industry, outline a step-by-step plan for action.
<i>Identify variables that affect the outcome of a process</i>	Experiment with or predict variables that affect the outcomes for a process (e.g., weather patterns that adversely affect a process, such as building a road).
<i>Infer situations that meet guidelines when complete information is not available</i>	<p>Given a policy or industry standard that has debatable interpretations, list possible situations that can arise that do not have clear solutions in the policy.</p> <p>Discuss or debate the issues.</p>
<i>Compare finished products to a set of guidelines</i>	<p>Compare a set of objects to a set of guidelines (e.g., analyze a batch of parts and document how they do or do not meet a set of Quality Assurance guidelines).</p> <p>List any discrepancies (parts that do not meet guidelines) and categorize them by type (e.g., burns, holes, etc).</p>
<i>Identify preventive measures for maintenance of a system</i>	List the needed routine maintenance to keep a system working properly.
<i>Predict new standards or rules that may become necessary in the future</i>	<p>Identify recent areas of change or development in your industry.</p> <p>Discuss potential future needs or developments that may occur (e.g., potential need for better training requirements for airport personnel).</p>

<i>Improve a process by streamlining (locating waste) or decreasing lost time</i>	<p>Examine a process in industry in step-by-step detail. Suggest ways to decrease time needed or make the process more efficient.</p> <p>Isolate the cause of failure in a process by performing an experiment.</p>
<i>Prepare a model explaining a concept</i>	<p>Build, draw, or create a model that explains a concept (e.g., show a need for environmental standards for water or air pollution).</p>

¹ Fry, Edward; Kress, Jacqueline; Fountoukidis, Dona. *Reading Teacher's Book of Lists*, 4th ed. ISBN 0-13-028185-9.

ACADEMIC STANDARDS FOR MATHEMATICS

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Topics Listing
Problem Solving
Operations and Calculations
Applications
Data Analysis and Display

Objectives

Classroom Applications to Industry

<p><i>Present</i> <i>Review and discuss</i> Master the list of skills employers want for the workplace regarding mathematics</p>	<p>Use the list of skills employers want to introduce students to the requirements of the workplace.</p> <p>Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts:</p> <ul style="list-style-type: none"> • Discussion • Interviewing parents or other adults in the workplace about the skills required • Interviewing employers about the skills in terms of importance • Identifying workplace situations in which certain skills become more important than others • Researching adult education programs to learn why deficits in these areas must be remediated and the cost spent yearly on these programs • Researching the topic of adult literacy
PROBLEM SOLVING	
<p><i>Examine, apply</i> problem-solving process</p>	<p>Define the problem What is being asked?</p> <p>Decide on a type of solution. Multistep or single-step question?</p>

	<p>Try any of these:</p> <ul style="list-style-type: none"> Estimate an answer Draw a diagram Find a pattern Guess and check Logical reasoning Make a graph Make an organized list Make a table Solve a simpler problem Use a simulation Work backwards Write an equation <p>Locate information you need. Do you have all the components?</p> <p>Get missing information. You may need to perform some other calculations</p> <p>Calculate. Look at the answer. How should the remainder be expressed?</p> <p>Check the solution. Is it reasonable?</p>
OPERATIONS AND CALCULATIONS	
<i>Read, write and count numbers</i>	<p>Read and write numbers (especially focus on very large and very small numbers where mistakes are common).</p> <p>Give a weekly quiz asking students to compare and sequence numbers. Example: 0.4445 ____ 0.4455 > or <</p> <p>Put these in order from smallest to largest: 0.66, 0.677, 0.67</p>
<i>Round numbers</i>	<p>Discuss your industry's use of decimals.</p> <p>Identify the place values needed to adequately perform a job. For example, a Quality Assurance Technician who works on the line</p>

	<p>in a manufacturing plant may need to use numbers through the ten-thousandths decimal place.</p> <p>Take a series of sample measurements, and round them to the nearest decimal place identified by the instructor.</p>
<i>Estimate numbers</i>	<p>The skill of making close estimations is tied to understanding accuracy. Discuss real-life situations in which estimation is used.</p> <p>Discuss the practice of estimation before calculation. Regular practice in estimating before calculating will teach students where they make errors and will increase their estimation skills.</p> <p>Discuss work situations in which estimation skills are required and possible consequences of making estimation errors. For example, is an estimate appropriate for inventory purposes? For ordering supplies?</p>
<i>Compute averages</i>	<p>Discuss averages in general terms. Calculate the average temperature, average rainfall or precipitation, average number of students per class, and other relevant examples.</p> <p>Using workplace materials*, calculate a series of averages. For example:</p> <ul style="list-style-type: none"> • Take 10 different measurements of a piece of pipe using a micrometer. • Compare the measurements. • Find the average of all the measurements. • Compare the average to the smallest and largest measurement. • Discuss the effects on quality. When is an average an acceptable benchmark measurement?
<i>Calculate with whole numbers; perform one-step problems with basic operations</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of addition,</p>

	subtraction, multiplication, and division.
<i>Perform problems that require an understanding of the order of operations</i>	<p>Using workplace materials*, make a list of situations or problems that need more than one step to perform them.</p> <p>If the procedures (add, subtract, multiply, divide, etc.) are on the same level of importance, such as adding or subtracting, then the order of operations will not impact the way the problem is solved.</p> <p>If a problem requires more than one level of operation to solve (example, dividing and adding), work the problem correctly by performing the division part first and then the addition. Rework the problem using addition first. Compare the answers.</p> <p>Discuss the importance of reasoning skills to verify that an answer makes sense.</p>
<i>Understand the relationship between decimals, fractions, and percentages</i>	Make a table comparing fractions, decimals, and percentages.
<i>Compute with fractions, decimals, and percentages, and show an understanding of the relationship between them</i>	<p>Create sample problems using fractions that relate to everyday situations.</p> <ul style="list-style-type: none"> ▪ Poll the class on interesting topics (favorite food). Convert whole numbers to fractions. Votes: Pizza- 10 Salad- 2 BBQ- 8 <p>$10+2+8 = 20$ (recognize denominator value)</p> <p>$\frac{10}{20}$ Pizza $\frac{2}{20}$ Salad $\frac{8}{20}$ BBQ</p> <ul style="list-style-type: none"> ▪ Add the fractions. $\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20}$ ▪ Convert the fractions to a whole number. (Total answer equals one class' worth of answers.)

	$\frac{10}{20} + \frac{2}{20} + \frac{8}{20} = \frac{20}{20} = 1$ <ul style="list-style-type: none"> Convert the fractions to percentages. $\frac{10}{20} \text{ means } 10 \text{ divided by } 20 = 0.50$ <p>Move the decimal two places to the right. $0.50 = 50\%$</p> $\frac{2}{20} \text{ means } 2 \text{ divided by } 20 = 0.10$ <p>$0.10 = 10\%$</p> $\frac{8}{20} \text{ means } 8 \text{ divided by } 20 = 0.40$ <p>$0.40 = 40\%$</p> <p>$50\% + 10\% + 40\% = 100\%$ Notice the totals add to 100%.</p> <p>So, $\frac{20}{20} = 1 = 100\%$</p> <p>Using workplace materials*, calculate work-related questions using fractions, decimals, and percentages.</p> <p>Calculate shipping costs for Internet purchases (such as music from amazon.com).</p>
<i>Solve formulas and equations</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of equations.</p> <ul style="list-style-type: none"> Work left to right Use order of operations Place numbers on one side, variables on the other side
<i>Obtain squares and square roots</i>	<p>Review the methods for calculating squares, square roots, cubes, and cube roots. Use industry-related formulas to demonstrate examples.</p> <p>Compare the difference between the two common answers to 32 (answer = 9, not 6).</p>

	How would an incorrect value affect the work on the job?
<i>Convert units of measure:</i> <i>Recognize components of measuring systems (U.S. and metric) for length</i>	Discuss industry measures and terms relating to length.
<i>Convert units of measure:</i> <i>Recognize components of measuring systems (U.S. and metric) for mass/weight</i>	Discuss industry measures and terms relating to mass/weight.
<i>Convert units of measure:</i> <i>Recognize components of measuring systems (U.S. and metric) for volume</i>	Discuss industry measures and terms relating to volume.
<i>Measure with a certain degree of accuracy</i>	Estimate measurements. Using workplace materials* and tools, take measurements of work-related and classroom items. Depending on ability level, students may measure to the nearest foot, inch, centimeter, etc.
APPLICATIONS	
<i>Solve word problems</i>	Help students feel more comfortable with word problems by placing simpler problems in word problem form; or take concepts students have already mastered and ask them to write word problems for each other to solve.
<i>Select/apply mathematical formulas</i>	Review a set of math formulas and then a list of sample problems. Decide which formula(s) apply to each problem.
<i>Understand the importance of time in the workplace</i>	Using workplace materials*, make a list of workplace scenarios that require using time correctly, such as keeping a time card or heating a liquid solution for 20 minutes.
<i>Recognize components of time systems (clocks and calendars)</i>	<ul style="list-style-type: none"> • a.m. and p.m. • Leap year • Military time
<i>Discuss, identify, understand terms relating to measuring time</i>	Discuss the units of time measurement and time vocabulary: second, minute, hour, day,

	week, month, year, leap year, fiscal year, quarter, annual, biannual, etc.
Understand that time can be expressed in terms of equivalencies	<p>Show the time equivalencies using fractions. For example:</p> $1 \frac{1}{2} \text{ days} = \underline{\hspace{1cm}} \text{ hours}$ $\begin{array}{rcl} 1 \text{ day} & = & 24 \text{ hours} \\ + \frac{1}{2} \text{ day} & = & +12 \text{ hours} \\ \hline 1 \frac{1}{2} \text{ days} & = & 36 \text{ hours} \end{array}$
Compute time conversions	<p>Make a table that shows the equivalencies of time units.</p> <p>Compute conversion problems at the appropriate level of difficulty. Examples:</p> <ul style="list-style-type: none"> • Convert minutes to hours • Convert hours to days • Convert seconds to years
Calculate ratio and proportion	<p>Review fractions when discussing ratio and proportion.</p> <p>Draw common classroom items to scale by finding a conversion rate (1 foot equals 1 inch).</p> <p>Make predictions using ratios. (If each student in the class has three children, how many children will there be altogether? Write the ratios.)</p>
Apply geometry principles: Use formulas for measuring shapes of two dimensions	<p>Determine the formulas that apply to two dimensions: perimeter, area, surface area. Find the perimeter of the classroom.</p> <p>Discuss the perimeter of objects that are not shaped as perfect squares. How does this change the formula for perimeter?</p> <p>Find the area of the tiles on the floor. Find the area of the classroom.</p> <p>Review that all areas are expressed in terms of square units (square inches, square miles, etc.).</p>

<i>Apply geometry principles: Use formulas for measuring shapes of three dimensions</i>	<p>Review the formulas that apply to three dimensions of objects: volume.</p> <p>Review that volume is expressed in cubic units.</p> <p>Find the volume of common objects such as soda cans, pizza boxes, etc.</p> <p>Discuss industry-specific needs for these formulas. For example, find the volume of a tank or silo.</p>
<i>Define terms relating to money</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles relating to money.</p> <p>For more advanced students, include terms and principles of economics, finance, or statistics.</p>
<i>Perform one-step problems involving money</i>	<p>Make change. (Count up--rather than backwards--to make change.)</p>
<i>Perform multiple-step problems using money</i>	<p>Calculate gross and net earnings.</p> <p>Calculate:</p> <ul style="list-style-type: none"> ▪ Interest ▪ Sales tax ▪ Percent off ▪ Sale price ▪ Profit percentages <p>Perform banking transactions.</p>
<i>Perform business-related financial activities</i>	<p>At a level of complexity appropriate to your industry and to students' ability levels, solve income/expense problems, prepare budgets, etc.</p>
<i>Use a calculator to perform computations</i>	<p>Identify appropriate activities that can be performed using a calculator (calculators allow students to concentrate on problem-solving strategies).</p>

	Award prizes for weekly activities or competitions.
<i>Calculate measurements taken from measuring devices</i>	Add, subtract, multiply, and divide measurement numbers by plugging them into formulas.
<i>Perform/prepare an inventory</i>	<p>Use a sample group of items to prepare an inventory. Discuss the math processes that would apply to the inventory process.</p> <p>Review inventory vocabulary terms.</p>
DATA ANALYSIS AND DISPLAY	
<i>Recognize types of visual representations</i>	<ul style="list-style-type: none"> • Charts • Graphs • Tables
<i>Interpret charts, graphs, and tables</i>	<p>Answer simple questions about charts, graphs and tables.</p> <p>Solve multistep problems involving the correlation of graphs and tables.</p>
<i>Collect/record data</i>	<p>As appropriate to industry, practice sampling methods. Discuss safety precautions for sampling. Visit OSHA at the Department of Labor Web site for more details.</p> <p>Practice collecting and recording sample data from your industry (such as measurements taken using a micrometer). Compare class answers.</p> <p>Find the range of answers (maximum and minimum). Find the average. Discuss an acceptable range of answers (\pm), and graph the results showing the number that fell inside and outside the acceptable range.</p>
<i>Review and apply principles of probability</i>	Use real-life examples that are highly motivating to direct the students' attention to probability principles. (Example, "I am thinking of a number between 1 and 50. The person who guesses the number will receive that many bonus points if s/he can tell me the

	probability of choosing the number correctly.”)
<i>Use probability models to predict chance events</i>	<p>Calculate <u>theoretical probability</u> of an event (e.g., the probability of rolling a 5 on a die is $1/6$).</p> <p>Find <u>empirical probability</u> of an event by performing repeated experiments. Compare the two probabilities.</p>
<i>Calculate and interpret statistics</i>	<p>Identify the importance of using statistics correctly. Bring examples of statistics from the news or media and analyze them: Are they ambiguous? Are they correct? What data is the advertisement trying to get the public to see?</p> <p>For a humorous look at statistics, see <i>How to Lie with Statistics</i> by Huff and Geis.</p>
<i>Interpret plans/blueprints</i>	<p>Review vocabulary and terms for plans, blueprints, and schematics.</p> <p>Build a plan or blueprint one layer at a time, starting with the basic identifying information.</p> <p>Add layers of wax paper or other transparent drawing material on top of the first layer that allows each layer to be viewed individually or the entire drawing as a whole.</p>
<i>Construct charts and tables</i>	<p>Discuss chart types and chart vocabulary.</p> <p>Using workplace or sample data from the class, construct tables and charts. For a daily example, consult <i>USA Today</i> online and look for the snapshots section that shows a graph of some sort. Ask weekly bonus questions about the data.</p> <p>Challenge students to bring in examples of charts and graphs containing errors.</p>

ACADEMIC STANDARDS FOR SCIENCE

Strategies for Reinforcement in the Career and Technical Education Classroom

Note:

* indicates industry-related materials, handouts, notes, etc.

Topics Listing

General Science: Topics not specific to a content area

Physical Science: Mechanics and Physics
Energy and Waves
Thermodynamics
Electromagnetism
Chemistry
Optics

Life Science: Cell Biology
Evolution
Genetics and Heredity
Human and Animal Development

Anatomy: Ecology
Viruses
Bacteria
Plants

Earth Science: Earth in Space
Solar System/Astronomy
Atmosphere and Weather
Oceans and Water
Earth Resources

Objective**Classroom Applications to Industry**

GENERAL SCIENCE	
<i>Present</i> <i>Review and discuss</i> Master the list of skills employers want for the workplace regarding science skills	Use the list of skills employers want to introduce students to the requirements of the workplace. Depending on students' ability levels, any of the following methods may be used to increase their understanding of the concepts: <ul style="list-style-type: none">• Discussion• Interviewing parents or other adults in the workplace about the skills required• Interviewing employers about the skills in terms of importance• Identifying workplace situations in which certain skills become more important than others• Researching adult education programs to learn why deficits in these areas must be remediated, and discover the cost to employers to educate adult workers• Researching the topic of adult literacy
<i>Perform</i> computations as required to solve problems	Use the metric system to convert units of measure. Round numbers to correct number of significant figures. Determine percentage of error. Understand validity, reliability, accuracy, and precision.
<i>Apply</i> scientific method of inquiry	Identify the steps of the scientific method. Conduct experiments. Understand the following terminology: <ul style="list-style-type: none">• Conclusions vs. inferences• Variables• Replications• Samples/sample size
<i>Investigate</i> science history as it applies to industry	In groups, research topics in science pertaining to your industry. Have students assign roles for each

	<p>member of the group.</p> <p>Present findings in report format or in oral presentations.</p> <p>Investigate science ethics.</p> <p>Recognize the processes available for accountability in industry. For example, OSHA has a Safety and Health Program Assessment Worksheet whereby employers can be rated for safety issues. See http://www.osha.gov/SLTC/safetyhealth_ecat/mod3.htm</p> <p>[Note: Safety and Health is a mandatory subject of bargaining when a workplace is unionized; in both unionized and non-unionized workplaces, an employer cannot create and dominate workplace safety committees (see the National Labor Relations Act).]</p>
<i>Use scientific instruments to measure aspects of the environment</i>	Gather data on time, length, mass, pressure, volume, acceleration, or other measurables using instruments from the job.
<i>Demonstrate an understanding of data</i>	<p>List the processes involved in gathering data.</p> <p>Suggest ways that data can be grouped or organized.</p> <p>Collect specimens.</p> <p>Show how data can be represented (graphically, charts and diagrams, etc.).</p> <p>Construct a model to depict a basic concept.</p>
<i>Identify the seven basic S I (Système International) units</i>	<p>Length: meter, m</p> <p>Mass: kilogram, kg</p> <p>Time: second, s</p> <p>Electric current: ampere, A</p> <p>Temperature: Kelvin, K</p> <p>Amount of substance: mole, mol</p> <p>Luminous intensity: candela, cd</p>

	For a dictionary of units, see http://www.ex.ac.uk/cimt/dictunit/dictunit.htm
<i>Identify S I (Systeme International) Derived units</i>	Choose units appropriate to your industry (hertz, ohm, volt, watt, etc.). Create a picture dictionary demonstrating the concepts.
<i>Review relevant theories, laws, and models</i>	As relating to your industry, discuss important theories, laws, and models.
<i>Use reference tools to solve problems</i>	Use scientific reference tools (such as the Periodic Table of Elements) to learn more about specific industry concepts.
<i>Practice safe lab procedures</i>	Handle equipment with care. Demonstrate safety and first aid procedures. Identify harmful substances.
PHYSICAL SCIENCE	
<i>Understand the cyclical nature of systems</i>	Show, demonstrate, model, track the cycles of any of the following systems: <ul style="list-style-type: none"> • Growth and decay • Food webs • Weather • Water
<i>Analyze/classify matter according to type</i>	Identify types of matter (solids, liquids, gases). Which types are predominantly used in your area of industry?
<i>Explain the concepts of work and power</i>	Identify machines used in industry. Identify how energy levels change when work or power is increased/decreased. Identify fuel sources used in your industry. Discuss internal and external combustion. Create a model demonstrating the uses of levers and pulleys.

<i>Be familiar with concepts of motion</i>	<p>Measure acceleration and deceleration. Understand the relationship between speed and velocity by performing experiments. Recognize waves and vibrations as a type of motion.</p> <p>Understand action and reaction. Review laws pertaining to motion.</p>
<i>Understand concepts related to force</i>	<p>Show the need for balance of forces acting on an object.</p> <p>Observe centrifugal and centripetal forces in action.</p> <p>Show how friction is created and must be accounted for in using and preserving equipment.</p> <p>Create a chart showing types of lubricants needed in a factory and schedule of maintenance.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of inertia.</p> <p>Show the relationship between pressure, mass, and weight.</p>
<i>Understand and apply principles relating to the atom</i>	<p>Understand that atoms have a positive, negative, or neutral charge. Classify protons, electrons, and neutrons. Identify ions.</p>
<i>Investigate forms of and changes in energy</i>	<p>Discuss how energy is measured.</p> <p>Observe changes in energy relationships. Identify catalysts and reactants.</p> <p>Identify sources of kinetic and potential energy in your industry.</p>
<i>Discuss, apply principles of electricity and electric currents</i>	<p>Identify types of circuits and switches.</p> <p>Show the difference between direct and alternating currents. Give examples of the best/most efficient use of each.</p>

	<p>Determine how electricity is measured, and solve problems using these terms. (Example, use Ohm's law to calculate current, resistance, and voltage.)</p> <p>Identify good conductors and insulators, and discuss how to choose them.</p> <p>Understand grounding, and create a visual display of grounding safety practices. Include the threat of static electricity.</p> <p>Show the uses of a vacuum tube by building a model.</p> <p>Compare the following ways of generating electricity:</p> <ul style="list-style-type: none"> • Hydroelectricity • Motors • Solar power • Steam/nuclear • Transformers • Incandescent (light) <p>Show the implications for your industry.</p> <p>As appropriate to your industry, identify electrochemical energy sources (cells, electrodes, batteries) and the processes of oxidation and reduction.</p>
<i>Be familiar with sound waves</i>	<p>Compare how sound waves travel between liquids, solids, and air.</p> <p>Examine different types (lengths) of sound waves.</p> <p>Examine decibels safe for human hearing.</p> <p>Identify safety precautions for industry regarding sound tolerance.</p> <p>Be able to use correctly the terms below as they relate to your industry. For example, ask students to write a short essay explaining a demonstration from class and include the following terms:</p> <ul style="list-style-type: none"> • Amplification

	<ul style="list-style-type: none"> • Audible range • Frequency • Acoustics • Resonance • Speed
<i>Be familiar with principles of heat</i>	<p>Differentiate between the three types of heat transfer (conduction, convection, radiation).</p> <p>Understand that substances expand and contract due to heating and cooling.</p> <p>Identify purpose and types of insulations used.</p> <p>Differentiate between heat and temperature.</p>
<i>Investigate and apply concepts relating to temperature</i>	Use the temperature scales; convert between Celsius and Fahrenheit.
<i>Explain the concepts of magnetism</i>	<p>Understand that currents create magnetic fields.</p> <p>Identify materials that are good conductors and the properties that make them such.</p> <p>Understand electromagnetic forces present in earth.</p>
<i>Investigate/apply chemical properties</i>	<p>Differentiate between acids and bases. Find pH for substances used in industry.</p> <p>Identify substances used in your industry and classify them by type.</p> <p>Name the major drugs, fertilizers, or additives used in your industry.</p> <p>Define and state examples of chemical reactions.</p> <p>Be familiar with solutions used in your industry.</p> <p>Compare saturated and unsaturated solutions.</p> <p>Determine whether a solution is soluble or insoluble.</p>

	Explain solute and solvent.
<i>Investigate forms of and changes in matter</i>	<p>Compare and contrast physical and chemical changes.</p> <p>Discuss the types of physical or chemical changes that take place in your industry from processing raw materials to manufacturing.</p>
<i>Understand and apply concepts relating to the elements</i>	<p>Examine the four elements that make up 99% of living organisms [hydrogen (H), oxygen (O), nitrogen (N), and carbon (C)].</p> <p>Element groups:</p> <ul style="list-style-type: none"> • Alkali metals • Alkaline earth metals • Transition metals • Other metals • Metalloids • Nonmetals • Halogens • Noble gases • Rare earth elements
<i>Be familiar with principles of light</i>	<p>Discuss light as a form of energy. Examine the light spectrum and note the relative smallness of visible light.</p> <p>Describe types of lighting systems.</p> <p>Define reflection and refraction.</p> <p>Explain how light carries information (by lasers), and show examples of the impact on technology/industry.</p> <p>Identify types of lenses.</p>
<i>Be familiar with principles of color</i>	<p>Diagram the main parts of the eye involved in seeing color (rods, cones).</p> <p>Use prisms to split light into the visible spectrum.</p> <p>Briefly explore color blindness. What precautions should colorblind people take regarding</p>

	<p>workplace safety?</p> <p>Define situations in which colorblindness impacts a worker's ability to do his/her job.</p>
LIFE SCIENCE	
<i>Explain the presence of cells as the identifier of all living organisms</i>	<p>Examine the cells of organic material used in your industry, using books, the Internet, or a microscope.</p> <p>Recognize that cells divide or replicate to promote growth of an organism.</p> <p>Examine the parts of a cell. Compare the cell to a machine. How do the parts function and rely on each other?</p> <p>Give examples of one-celled and multiple-celled organisms.</p> <p>Review the classification system of all organisms (kingdom, phylum, etc.).</p> <p>Create a circle graph or pie chart (totaling 100%) showing the relationship (in numbers) between the groups of organisms:</p> <ul style="list-style-type: none"> • Bacteria • Fungi • Viruses • Insects • Plants • Vertebrates • Invertebrates <p>Compare some of the cell processes (active and passive transport) with the processes in your industry.</p>
<i>Understand the progress of evolution of organisms</i>	<p>Recognize how a species will adapt to better fit in its environment over time.</p>
<i>Explain the role of genetics in human development</i>	<p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of heredity, including:</p> <ul style="list-style-type: none"> • Half of an individual's genes are contributed by each parent

	<ul style="list-style-type: none"> • Traits that are inherited are either dominant or recessive from the parent(s) • Cell division by mitosis vs. meiosis • Disabilities are caused either by genetic/inherited conditions (such as Down's Syndrome) or in accidents occurring after birth, such as brain damage due to a car accident or a stroke
<i>Investigate/apply</i> principles of human development	<p>Describe the life cycle of humans and other animals.</p> <p>Use the concept of human development to explain the need for understanding foundation skills in your area. (For example, children do not run before they walk.) Use this concept to explain other events that occur in a natural order in your industry.</p>
<i>Explore</i> additional concepts pertaining to humans and other animals	<p>Give examples of ways organisms adapt to their environment.</p> <p>As relating to industry, review the concepts of:</p> <ul style="list-style-type: none"> • Aging • Immune system • Skin and Tissues • Blood and hemoglobin • Disease
<i>Compare/contrast</i> the differences between sexual and asexual reproduction	<p>Determine instances when understanding the concepts of sexual reproduction are important for your industry.</p> <p>Highlight the effects of unsafe working practices on unborn fetuses or the dangers present for pregnant women working in industry.</p>
<i>Show</i> a general understanding of the importance of health	<p>Explore the cost of lost wages and worker's compensation in the past year due to health problems.</p> <p>Research the most common health problems among workers (workers with safe jobs; workers with most hazards to health, etc.).</p>

<i>Investigate</i> the food cycle	<p>Identify food chains, food webs, food pyramids. Show how changes to the food cycle affect the environment and humans. Name the food groups.</p>
<i>Understand</i> nutrition and the body's need for a diet that provides vitamins and minerals	<p>Show an understanding of body systems (circulatory, nervous, digestive, etc.) as they relate to industry.</p> <p>Identify deficient vitamins and minerals among a particular population (American workers, workers in specific environments, workers who do not go outdoors, or those who always work outdoors) and the health risks associated with job types (office work, mining work, etc.).</p>
<i>Observe</i> health code/sanitation requirements	<p>Research the development of health code and sanitation requirements, including OSHA.</p> <p>Compare/contrast workplaces of 1850, 1900, 1950, and 2000 regarding health and safety.</p> <p>Discuss the most common workplace violations of health requirements and present in a graphic format (e.g., maps, charts).</p> <p>Discuss potential effects of ignoring health requirements.</p> <p>After identifying workplace hazards, create several plans to treat the problem. Debate the benefits of each.</p> <p>To avoid the threat of employers choosing ineffective means of ensuring safety on the job, locate MSDS sheets, first aid stations, personal protective equipment, worker's compensation claims offices/paperwork, etc.</p> <p>Using workplace materials*, locate the section on safety regulations. Ask students to rank the items. Debate the importance of each. Determine the threat of ignoring regulations. Research which regulations are often disregarded.</p> <p>Explore proactive measures students can take to extend their health.</p>

	Understand the importance of mental health in addition to physical health.
<i>Investigate/apply</i> principles of anatomy and physiology	<p>As relating to your industry, explore issues relating to anatomy and physiology.</p> <p>Study the skeletal system--the bones of the arm, hand, and neck. Research carpal-tunnel syndrome.</p> <p>Identify the types of fractures and those most common to your line of work. Learn how to prevent falls.</p>
<i>Understand</i> basic principles of ecology	<p>Define ecology.</p> <p>Identify five major ways in which people interact with the environment, especially as relating to your industry.</p> <p>Discuss the effectiveness of the media as compared with pro-science groups (such as Greenpeace) on the public's awareness of important environmental issues.</p> <p>Identify any areas of concern regarding waste/waste management in your industry.</p> <p>Show the difference between a niche, community, habitat, and ecosystem.</p> <p>Give examples of herbivores, carnivores, and omnivores. How does your industry use and serve each group?</p> <p>Understand predators' effects on food chains. Identify predators of industry.</p> <p>Explain the process of decomposition and decay. How does industry interfere with or interrupt these processes?</p>
<i>State</i> the differences between viruses and bacteria	<p>Define viruses and bacteria. Explore viral and bacterial threats present in the workplace. How can they be prevented? How can they be treated?</p> <p>State the benefits of viruses and bacteria.</p>

	Explain the recent increased resistance to drugs and antibiotics.
<i>Understand</i> basic concepts relating to plants	<p>Describe the interchange of oxygen and carbon dioxide between plants. Contrast it with the way humans exchange oxygen and carbon dioxide.</p> <p>As relating to industry, review the concepts of:</p> <ul style="list-style-type: none"> • Fertilization • Parts of a plant and functions of each • Effects of temperature on plants • Need for water and light • Photosynthesis
EARTH SCIENCE	
<i>Recognize</i> earth's position in the universe	<p>As relating to your industry, identify relevant topics regarding:</p> <ul style="list-style-type: none"> • Asteroids • Comets • Stars • Galaxies <p>Identify the planets in the solar system. Compare and contrast earth with other planets.</p> <p>Create a model showing the relative size of earth within our solar system. Use mathematical relationships to make sure the scale is correct (earth is the size of ____, so the sun should be the size of ____).</p> <p>How do the phases of the moon and sun affect the hemispheres?</p>
<i>Investigate</i> the history of the earth	<p>Identify geological, chemical, and other methods of determining the age of an object.</p> <p>Demonstrate that fossils and rocks are indicators of previous eras.</p> <p>As a class, create a timeline indicating the age of the earth. Include the various ages (Ice Age, etc.) and the length of each. Make sure the timeline is drawn to scale. Assign each age to a group and research the following:</p>

	<ul style="list-style-type: none"> • Weather • Major events at beginning and end of age • Organisms living during this time • Factors that made the age unique
<i>Investigate</i> physical characteristics of the earth	<p>Label/model the components of the earth.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of gravity.</p> <p>Solve problems of longitude, latitude, and time zones.</p> <p>Create a model of the ratio of land and water on earth.</p>
<i>Investigate</i> physical forces acting on the earth	<p>Examine erosion and depletion of nonrenewable resources.</p> <p>Identify natural disasters such as hurricanes and earthquakes. Research the effects of a past disaster on a specific industry.</p> <p>Understand, at a level of complexity appropriate to your industry and to students' ability levels, basic principles of plate tectonics (the earth's surface is broken into large plates; movement of these plates over time causes earthquakes and other geologic activity).</p>
<i>Explain</i> the basic components of earth's rotation	<p>Understand that the earth spins on its axis at an angle of 23 ½ degrees. Identify the period of one complete rotation as a day; longer cycles of rotations identify the seasons.</p> <p>Discuss time zones.</p>
<i>Identify</i> the earth's atmosphere and its components	<p>Identify the main elements in the earth's atmosphere (nitrogen and oxygen).</p> <p>Identify layers of the atmosphere and ozone layer. Explain concepts of air pressure.</p>
<i>Understand</i> basic principles of the solar system	<p>Demonstrate how the sun strikes the earth at different angles depending on location.</p>

<p><i>Demonstrate the relationship between climate and weather</i></p>	<p>Identify the factors that create weather.</p> <p>Show how landscape features are affected by changes in climate or weather.</p> <p>Identify the greenhouse effect. How does industry contribute to it?</p> <p>Describe the relationship between altitude and weather.</p> <p>Understand that changes in the weather may be seen as fronts that are put in motion by the jet stream.</p> <p>Identify types of precipitation.</p> <p>Differentiate between types of clouds.</p> <p>Understand the effect of winds, wind speeds, and impacts on vegetation.</p>
<p><i>Learn and apply concepts relating to the oceans</i></p>	<p>Label the major oceans and seas. Determine the elements in ocean water (nearly all elements are present).</p> <p>Identify or draw the structural components of the ocean floor.</p> <p>Explain the relationship between the moon and the tides.</p> <p>Explore ways the ocean is used for power and business.</p>
<p><i>Investigate principles of water</i></p>	<p>Identify the parts of the water cycle and the effects of the processes involved.</p> <p>Define water's chemical properties:</p> <ul style="list-style-type: none"> • Water is the universal solvent • Water has a neutral pH of 7 • Chemically, water is one atom of oxygen bound to two atoms of hydrogen <p>Measure salinity. Which industries rely heavily on water?</p>

	<p>Define water's physical properties:</p> <ul style="list-style-type: none"> • Water is the only natural substance that exists as solid, liquid, and gas • Water's surface has a high density • Water has a high tolerance for heat (heat index) • Water's weight • Water as a coolant • Specific gravity
<i>Investigate conservation of physical and natural resources</i>	<p>As relating to your industry, discuss or debate the issues of:</p> <ul style="list-style-type: none"> • Allocation of resources • Recovering resources • Best/worst methods of using resources <p>Compare/contrast renewable and nonrenewable resources.</p> <p>Note the important developments in your industry regarding mineral, soil, water, and wildlife conservation.</p> <p>Discuss alternative sources of energy as relating to your industry.</p>
<i>Investigate issues regarding scientific technology</i>	<p>As relating to your industry, discuss the uses of technology. What are the newest developments? What effects does the technology have on our society? Political system? Discuss the role of economics on technology.</p>
<i>Apply science principles/laws to environmental issues</i>	<p>Discuss how humankind alters the earth and environment through pollution and the use of resources and technology.</p>

Crosswalk to Skills USA Contest in Advertising Design

Skills USA, the co-curricular student organization for Trade and Industrial Education, provides many opportunities through its program of work for students to apply the knowledge, skills, and processes learned in a variety of courses. A correlation of the Advertising Design technical contest to selected tasks/competencies in Arkansas' Advertising Design courses are provided as a supplement to this framework.

Purpose

To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of advertising

Clothing Requirement

For men: Official white polo shirt with black dress slacks, black socks, and black leather shoes

For women: Official white polo shirt with black dress slacks or skirt, black socks or black or clear seamless hose, and black leather shoes. To purchase the polo shirt, contact Midwest Trophy Manufacturing Co. Inc. by calling 1-800-324-5996 or order online at:

<http://www.mwtrophy.com/vica/index.html>.

Eligibility

Open to active SkillsUSA members enrolled in programs with advertising design or commercial art as the occupational objective

Equipment and Materials

- Supplied by the technical committee:
 - Drawing tables and stools
 - Drawing boards, as required
 - Required illustration board and repro material

- Adaptable scanner
- All necessary information and furnishings for judges and technical committee
- Supplied by the contestant:
 - T-square, 36" minimum
 - Triangles
 - Rulers
 - Masking tape
 - Rubber cement or other non-aerosol adhesive
 - Assorted pencils
 - Ink and assorted technical pens
 - Eraser
 - Cutting tools (razor blades, X-ACTO knife, mat knife, and scissors)
 - Assorted felt tip markers
 - 14"x17" drawing/graphics pad
 - 14"x17" tracing pad
 - Drafting kit (compass, dividers, etc.)
 - Any additional desired medium for sketches, rough layouts, and comprehensives
 - Any additional tools or art supplies desired by the contestant to complete the project as approved by the technical committee.126 *SkillsUSA Championships Technical Standards (2002–2004)*

SkillsUSA Championships

Advertising Design Rating Sheet

- Thumbnails:
 - Required number of completely different design specifications (size and number of elements)
 - Reasonably clear copy indication
 - Reasonably clear art indication
 - Proportion to final comprehensive
- Roughs:
 - Development of ideas from thumbnails

- Required number of completely different designs
- Specifications (size and number of elements)
- Reasonably clear copy indication
- Reasonably clear art indication
- Application of color
- Proportion to final comprehensive
- Neatness
- Comprehensive:
 - Development of ideas from roughs
 - Specifications (size and number of elements)
 - Appropriate use of color
 - Typography application, design, and accurate indication
 - Aesthetics of final comprehensive
 - Neatness
 - Creativity
- Camera-ready art items evaluated:
 - Ruling (technique and accuracy)
 - Indication and markup of photo and/or illustration
 - Amber-cutting techniques
 - Registration
- Paste-up assembly:
 - Horizontal alignment
 - Vertical alignment
 - Headline spacing
 - Position of elements
 - Cutting and pasting of elements (accuracy and neatness)
 - Crop marks
 - Reproduction instructions
- Computer art evaluation
 - Followed directions (size, number of elements, placement, document saved, contestant number on layout)

- Accuracy
- Horizontal alignment
- Vertical alignment
- Position of elements
- Type size, leading placement

Written test

CLOTHING PENALTY (minus 0 to 5 percent of total points)

Arkansas' All Aspects of Industry

Defining “All Aspects”

All aspects of an industry include, with respect to a particular industry that a student is preparing to enter, planning, management, finance, technical and production skills, underlying principles of technology, labor and community issues, health and safety, and environmental issues related to that industry. Planning is examined at the level of both an individual business and the overall industry. Planning elements might include:

- Developing strategic plans—mission, vision, goals, objectives, and/or a plan of action
- Working with planning tools such as surveys, market research, and competitive analysis
- Anticipating needs for staffing and major purchases of equipment and supplies
- Developing plans for training and upgrading of staff
- Forecasting market trends
- Developing business plans for entrepreneurial ventures

Management addresses methods typically used to manage enterprises over time within the industry as well as methods for expanding and diversifying workers' tasks and broadening worker involvement in decisions. Key elements of management might include:

- Using an organization chart to explain how a corporate chain of command works
- Providing input for strategic plans and communicating the company's vision and mission statements
- Leading employees in carrying out strategic plans and action plans
- Evaluating employee performance
- Anticipating technology and other major purchasing needs
- Ensuring equity and access for employees
- Resolving conflicts
- Developing job descriptions and written policies/procedures
- Identifying recruitment procedures, training opportunities, methods of evaluation, and retention strategies
- Working with professional associations and community outreach efforts

Finance examines ongoing accounting and financial decisions and different methods for raising capital to start or expand enterprises. Finance functions might include:

- Developing budgets
- Preparing financial statements
- Analyzing and managing financial transactions and records
- Implementing payroll procedures
- Determining and paying taxes
- Identifying indirect wage costs (benefits, FICA, insurance, worker's compensation)
- Making loans and granting credit to customers
- Developing graphs and charts related to company finances
- Identifying and implementing methods of sustaining profitability of a business
- Managing 401K plans
- Identifying sources of capital

Technical and production skills cover specific production techniques and alternative methods for organizing the production work, including methods that diversify and rotate workers' jobs.

Technical and production skills that an employee should have to succeed in a business or industry might include:

- Developing and upgrading job-specific skills
- Using troubleshooting and problem-solving techniques
- Analyzing information to make decisions
- Identifying and implementing quality assurance techniques
- Employing communication skills such as writing, listening, speaking, and reading
- Participating in team efforts
- Implementing projects and new techniques
- Demonstrating basic computer skills; employing time-management techniques in completing projects and assigned tasks
- Demonstrating ethical behavior and work ethic

Underlying principles of technology provide an integrated study across the curriculum of the mathematical, scientific, social, and economic principles that underlie the industry's technology.

Principles of technology that an employee should know might be demonstrated by:

- Exhibiting proficiency in mathematical and scientific functions related to new and emerging technologies
- Continuously upgrading job skills needed to implement new technologies
- Participating in industry certification programs
- Cross-training to enhance one's value to the organization and to enhance job promotion opportunities
- Understanding and adhering to ethical issues related to technologies

Labor issues examine worker rights and responsibilities, labor unions and labor history, and methods for expanding workers' roles. Labor issues might include:

- Understanding and implementing worker rights and responsibilities
- Working with labor unions
- Keeping abreast of local, state, and federal legislation affecting employee and employer rights and responsibilities
- Negotiating and settling worker disputes
- Identifying certification requirements for specific jobs
- Analyzing the impact of labor agreements on business operations

Community issues explore the impact of the industry on the community and the community's impact on and involvement with the industry. Concepts of business and community relations might include:

- Developing and working with community outreach projects
- Participating on advisory committees and community organizations
- Working with professional associations
- Developing and implementing public relations plans
- Participating in community service projects

Health, safety, and environmental issues examine these concepts in relation to both the workers and the larger community. Concepts related to health, safety, and the environment might include:

- Identifying and implementing federal, state, and local regulations related to the health and safety of employees
- Understanding and strictly adhering to federal, state, and local environmental regulations related to the business
- Identifying job-specific health hazards and safety issues
- Identifying and implementing basic safety and first aid training techniques for emergencies such as personal illness or injury, tornadoes, fires, nuclear accidents, floods, and incidences of employee-rage or violent behavior
- Communicating safety regulations and plans to employees
- Working with selected community groups to implement safety programs